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DIY HDTV TV Antenna (Bowtie)



Build your own HDTV TV Antenna to cut the cord from your cable provider and save \$1000 a year. This DIY antenna is very easy to build with just a few basic tools and a few supplies available from the hardware store.

After being disappointed with the current channel offerings and ever increasing price of our local cable provider, we recently decided to disconnect our cable TV service and go for over the air broadcasts as well as the many online services available now. I built this **DB4 antenna**, also called a **bowtie antenna**, to increase the range of signals I could pick up over the basic rabbit ears antenna.

This is the first of two antenna designs I've built. [Subscribe](#) or come back soon to see the second version of the DIY HDTV TV antenna.

Parts Needed:

13 feet of 12 gauge Electrical wire

10x Wood Screws (I actually used 6 x 1/2" metal screws)

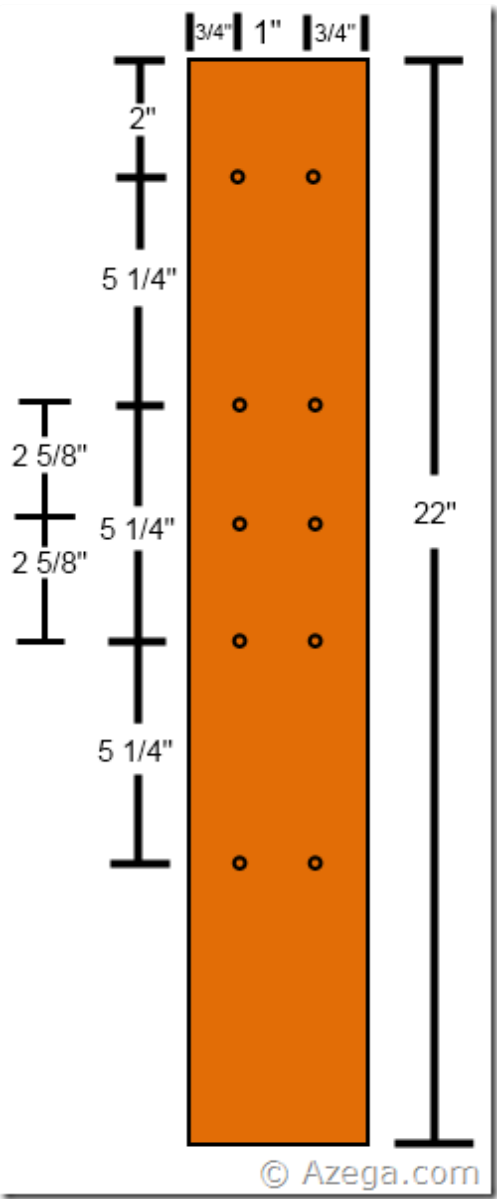
10x #10 Washers

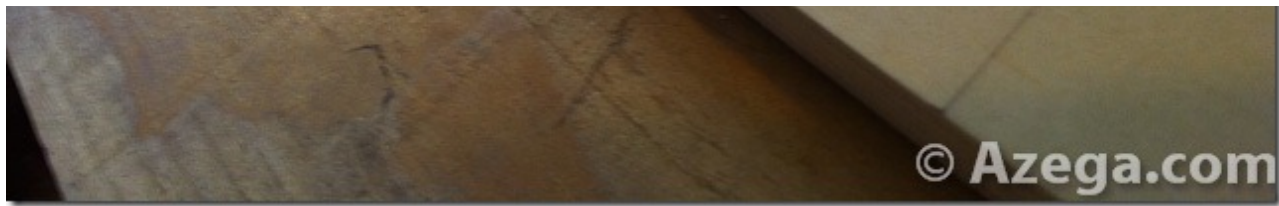
Matching transformer (balun)

1x3 or similar size board around 22 inches long



Start by cutting the 1×3 to length and marking the spots for the holes. Make the first set about 2 inches from the top and then measure 5 1/4 inches to the next set and and continue down making each set of holes 5 1/4 inches apart. The holes for each set will be centered on the board and 1 inch apart.





Drill out the spots you marked for the screws with a 1/16 drill bit. This may be unnecessary, but I like to do it to keep the wood from splitting.



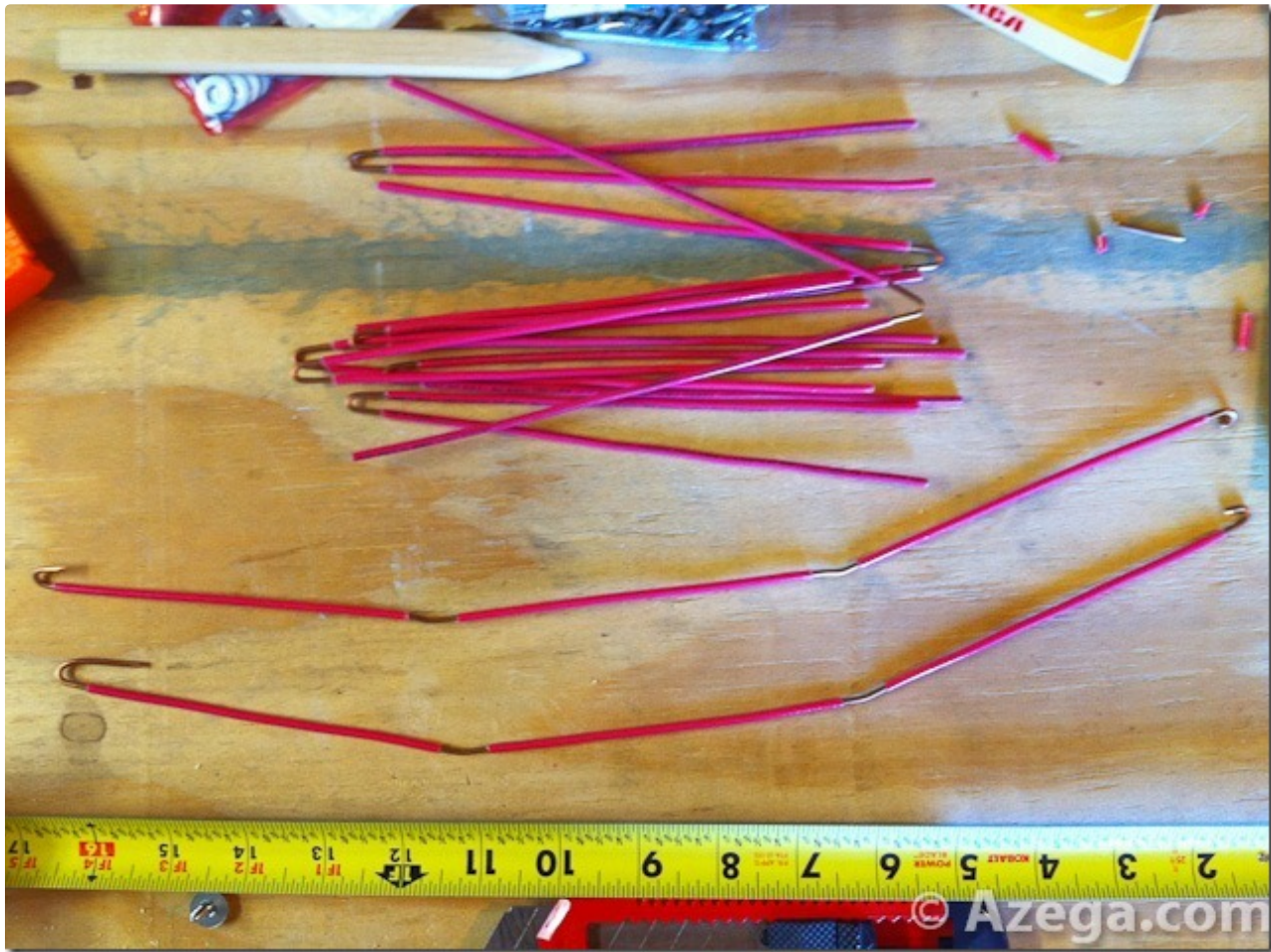
Cut 8 pieces of wire about 15 inches long. They only need to be 7 inches after folding in half, but I like to add a little extra and cut them to length later. I bought electrical wire off the spool by the foot. You can also get romex type 12-2 or 12-3 house wire with three or four wires in a sheath (hot, neutral, ground). Romex is a couple cents cheaper per foot, but requires more work to split the sheath and separate the wires.



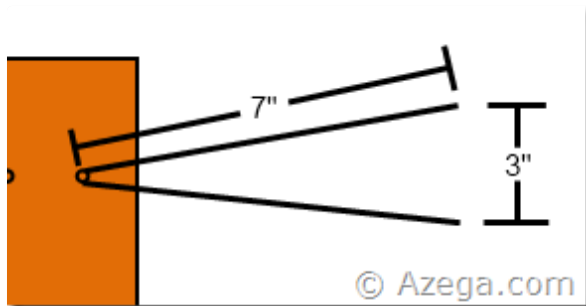
I couldn't find any bare wire, so I needed to strip the insulation off the areas where the connections needed to be made. I used a wire stripper to score both ends of the area to be stripped then used a utility knife to split the insulation and peel it off.

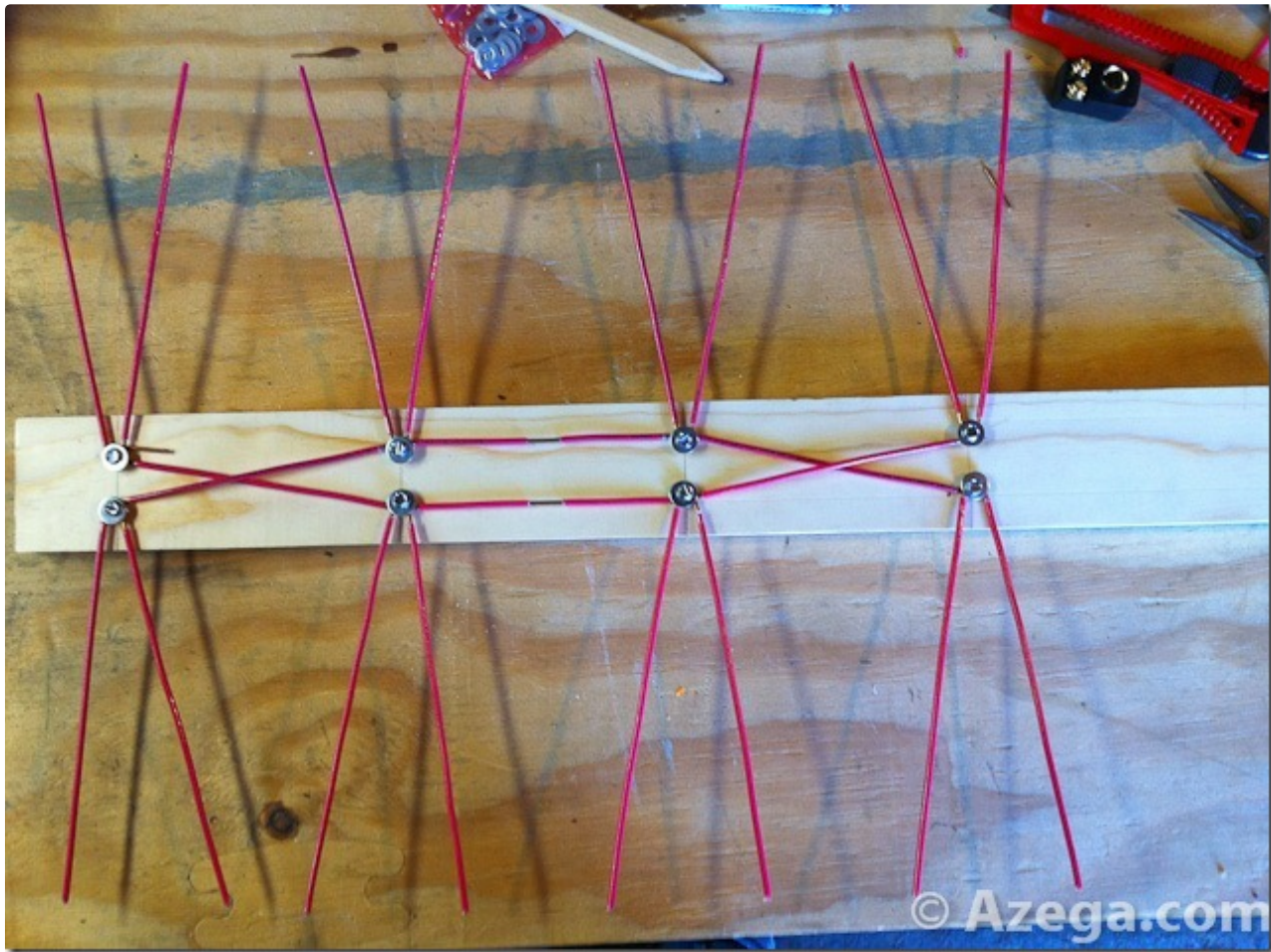


Bend the wires into "V" shapes then cut two more pieces of wire about 17 inches long to connect the bowties. Strip the ends and three spots on those wires to make contact with the center nodes and the center tap. (only the two nodes are shown stripped in the picture below)



Next put everything together with the screws and washers. Make sure everything is snug and all the bare areas of wire are touching. Measure from the screw to the tips of each "V" and cut them off at 7 inches. Then spread the tips apart 3 inches.





This is the only kind of balun (matching transformer) I could find at the hardware store when I was getting the other supplies. It isn't exactly what I was looking for, but it will work with a little modification. This matches the high impedance of the antenna to the lower impedance of the receiver.



This is what it looks like on the inside.



I cut a hole in the side of the balun then cut the end off a piece of coax cable I had and soldered it to the contacts of the coax connection.



So it looks like this.



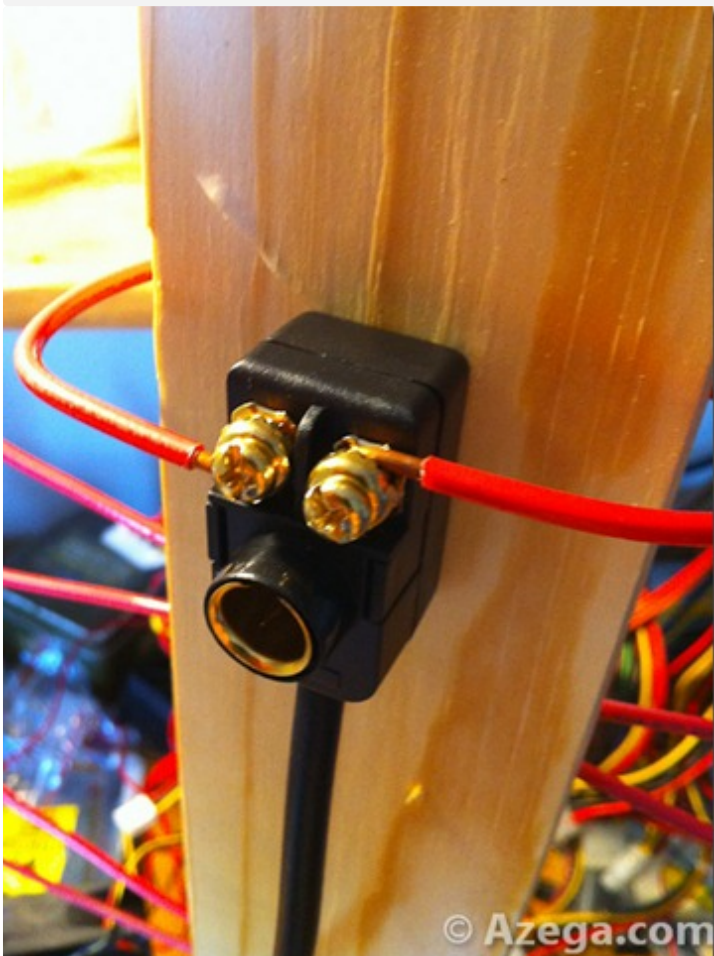
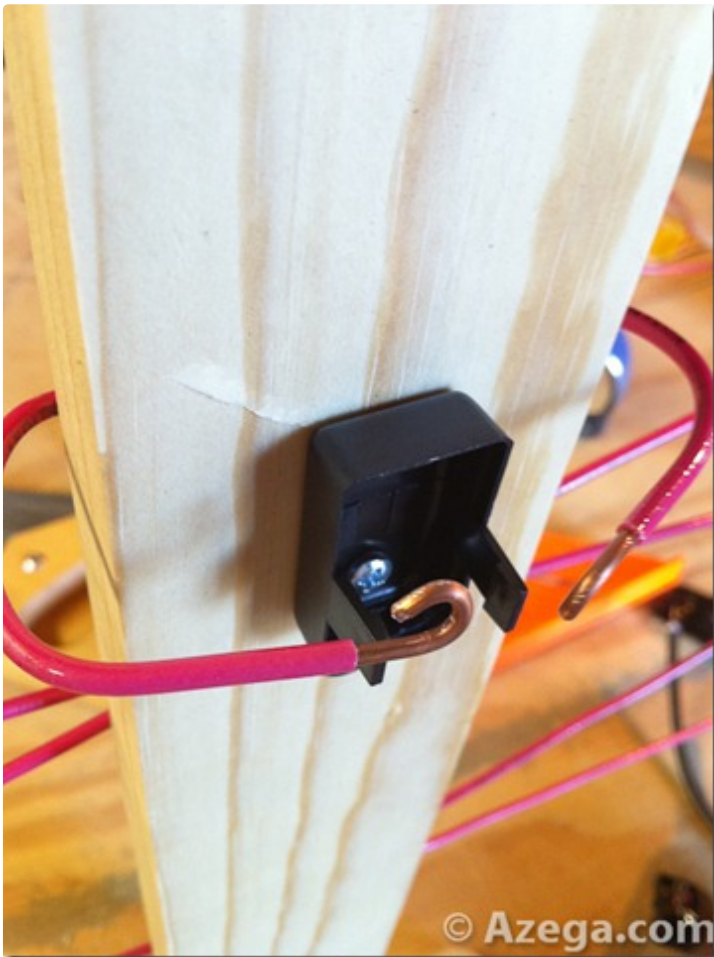
I cut, stripped, and bent two short pieces of wire to attach the balun to the back of the antenna.



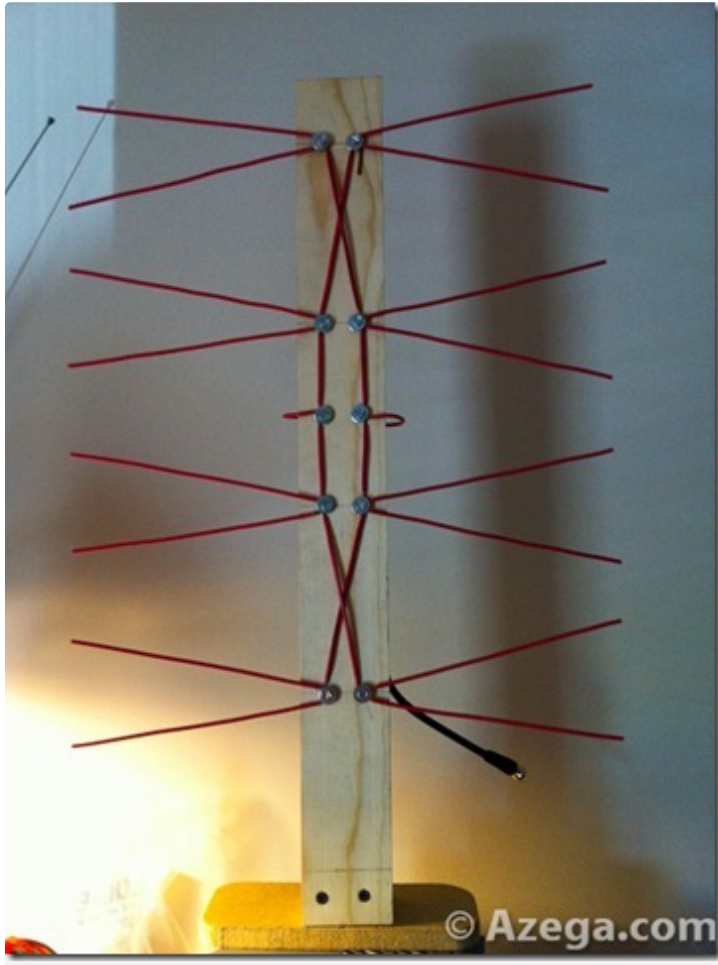
I screwed the connections for the balun to the front and wrapped the wires around to the back so I could attach it to the back.



Here I screwed the cover for the balun to the back of the antenna to hold it in place, then attached it and secured the wires with the pigtail hanging down.

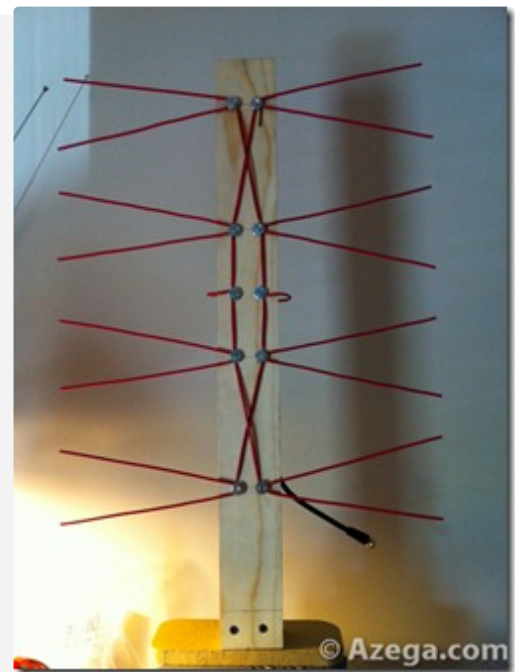


And here's the end product. I used some scrap wood to build a base for it. What you do here would depend on where you plan on mounting it. I just wanted to set it on a shelf for testing, so a simple base worked for me. I will eventually mount it permanently in the attic for better reception.

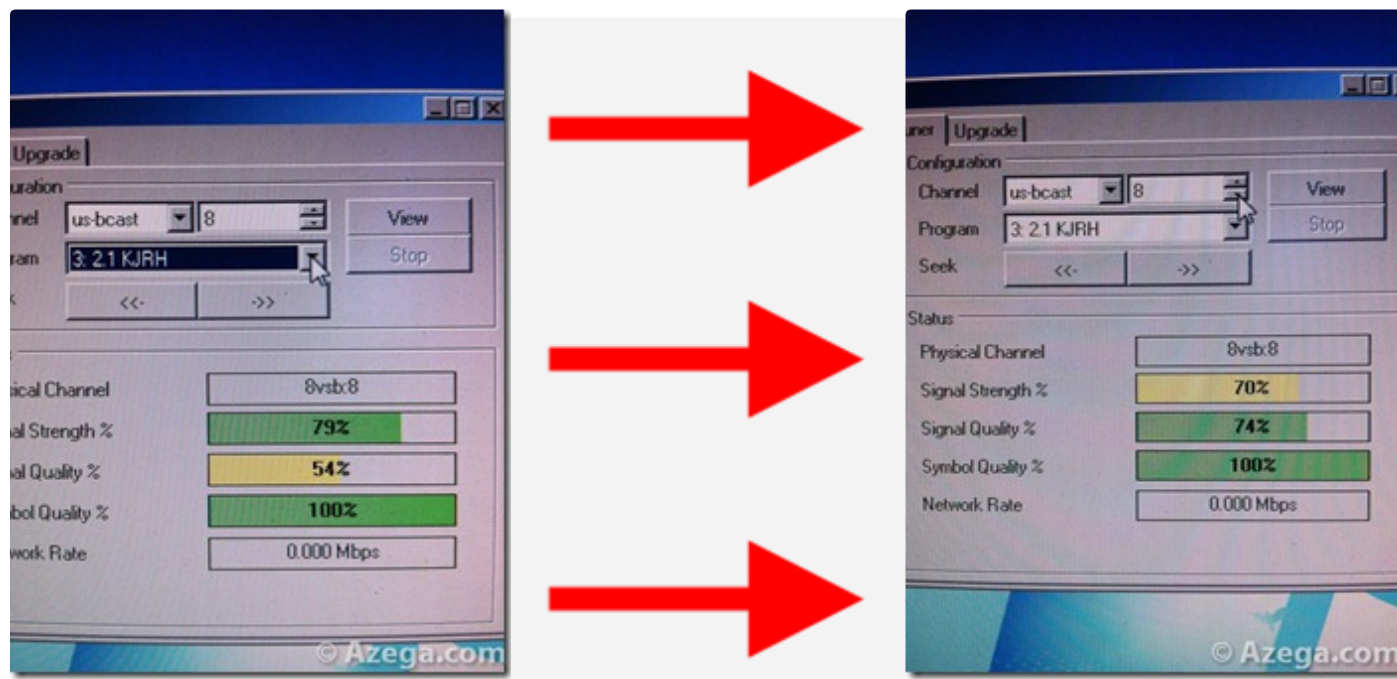


Results:

Here are the results I achieved after switching from a normal set of rabbit ears to the bowtie antenna.



I'm using an **HDHomeRun** connected to my windows media center as the TV tuner. Below is the software that came with it showing the signal strength.



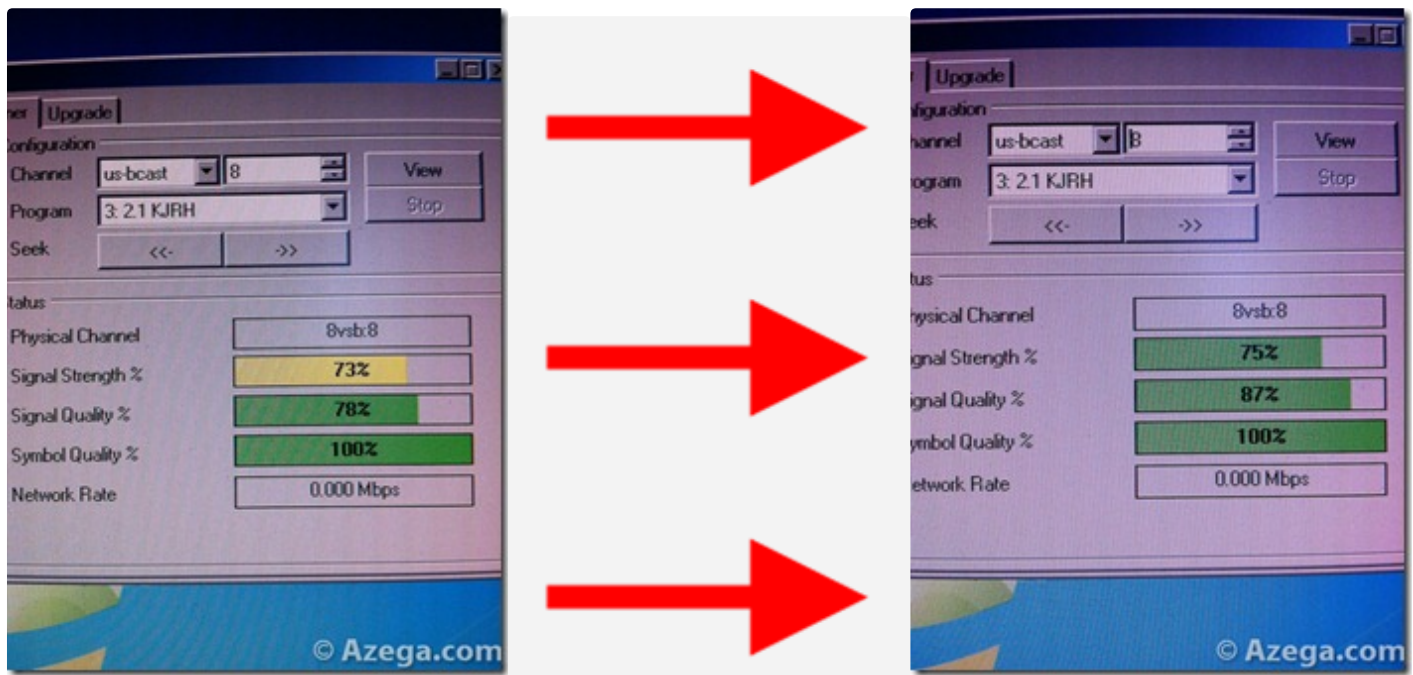
As you can see, the signal strength went down, but the signal quality went up, which I think is the more important number.

Update:

While, the reception was better, it wasn't what I was expecting, especially since I live just a few miles away from several TV stations. I finally found a different kind of **balun (matching transformer)** at Radio Shack and decided to give it a try.



Results Round #2:



As you can see here, switching to the better balun made a significant improvement. The signal strength is still lower than the original rabbit ears antenna, but the signal quality is noticeably higher.

Update #2:

I'm still not happy with the results, and after doing some research, I think the issue is signal reflection. Basically, since I'm so close to the source and the signal is so strong, I'm getting reflections of the same signal from different directions at slightly different times. These out of sync signals are interfering with each other and causing the signal to drop out often.

To solve this all I need to do is to add a reflector to block the signals coming from behind the antenna. I didn't discover this until after I had built a different design. To see my new design based on the Gray-Hoverman Antenna and the reflector I added to it, stay tuned to this blog by [subscribing to the RSS feed](#) or the [email newsletter](#) at the top of this page and you will be informed as soon as I have posted it.



Let me know if you have tried this design and what your results were in the comments below.

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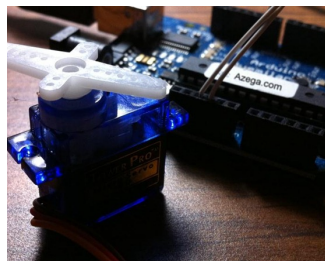
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14 comments to DIY HDTV TV Antenna (Bowtie)

bushidoka

August 9, 2011 at 6:28 am

Hey there, I'm looking for good instructions on building a gray-hoverman, but cannot seem to find any. The original plans I found of course, over on digital home. But that is not really a how-to guide and it looks like I need a PhD in antenna design to do anything with what they have there.

Did you ever get around to documenting your build?

Tammy

December 7, 2011 at 1:27 am

I made two of these. One from coat hangers. The other from a spool of thin alluminum wire. They both are working fantastic. Am getting loads of channels.

Motsco

June 17, 2012 at 10:33 pm

The red X wires are supposed to be kept at least an inch apart. That's not electricity you're playing with, but rather Radio Frequency Energy. Terribly common mistake on almost ALL Internet-inspired antennas.

Send me an e-mail and I'll send you a picture or two of a cool one I built with stuff from the dumpster. I live 20 minutes outside the BIG CITY.

Put 'HDTV ANTENNA' or something similar in the SUBJECT so I don't trash it as SPAM, thanks.
Motsco.

Edmonton, Canada

Kirby

October 14, 2012 at 12:12 am

I wonder if the lower signal strength of your homemade antenna is due the frequency of the channel you were testing. Channel 8, at around 180 MHz, is in the high VHF range. The rabbit ears would be receiving this station on the long elements. I think your bowtie antenna is sized primarily for UHF reception. Admittedly, I know next to nothing about antenna design, but maybe some longer elements are needed in order to improve reception of channel 8.

Wally

November 3, 2012 at 7:53 pm

Uh...I think your problem is your using a uhf antenna to try to bring in a vhf channel. From your software, it looks like your trying to bring in channel 8, which is VHF, whereas the four bay bow tie antenna you built is pretty much only good for UHF, channels 13 through 60 or 70 or something really high that I don't have to worry about in my area. It looks like you did everything right, although the dimensions are somewhat small...that would mean that your antenna would do even better at the higher end of the UHF...say, channels 40 and up, although it should do fine for 13 and up.

If you are just using it indoors, hard to say anything. There are so many potential problems with an indoor antenna. All kinds of reflections, noise, refractions, etc. You should try putting it in a window facing some towers with UHF channels...it should be fine.

Greg

March 24, 2013 at 9:40 pm

I also made two of these antennas. The first was from wire coat hangers. The second was from wire that I bought at Lowes.

I received all [30+] of my local channels. I actually locked some out.

I've since moved to a different address. I'm going to build a larger version [with either 8 or 10 bays] and mount it outside above my roof.

My Name

August 6, 2013 at 2:41 pm

I've made several of these. My latest has 10 inch elements, 5 inches spread at the V, with 9.5 inch spacing between elements. It gives better gain at upper VHF frequencies, 189 Mhz, but performs well at 630 Mhz.

Bill Maybery

December 14, 2013 at 7:12 pm

I have made two of your design (with some modifications) and the results are great. Even the channel that is 62 miles away in very hilly country. The design seems to have a very narrow signal pattern with only 10 or 15 degrees from no usable signal to max signal. The problem I'm having is rf channel 38 is on the same tower as rf channels 31 and 48 but channel 38 has no signal even though that station is stronger (1000 kW) than either of the other two (700 kW and 960 kW). Is there any way that a block of channel 38 could have been built into the antenna?

I have been testing these antennas outside. Will putting them under the roof attenuate the signals enough to keep the strong signals from overwhelming the signals from the strong stations?

I mount the back of the board on a 3/4 PVC with plastic clamps and then mount the PVC to the side of the upper deck vertical support. That give me the opportunity to loosen (slightly) the PVC and turn to tune the direction. I plan to do the same in the crawl space above the garage with the PVC extending through the ceiling of the garage for any necessary further directional tuning.

I am considering using glue to hold the wires in place and soldering the points of contact. Do you see any problems with this method?

petes

January 26, 2015 at 11:44 pm

I'm wondering if 12 gauge wire is really necessary, if you see the wire from the adapter is really thin.

Lucas

February 4, 2016 at 11:31 pm

Solder all connections will not cure multipathing however will significantly lower the resistance of connection thus will lower the impedance and put much closer to 300Ohms thus increasing gain and decreasing VSWR & overall gain rated in dbd any other? Contact me via FB

73's

Lucas KB9MEJ

Lucas

February 4, 2016 at 11:38 pm

The thicker the wire the more sturdy and more broad banded the antenna will be I used 6AWG solid fine wire and soldered all connections and all the different sizes I made work fantastically also if mounting outside use stainless steel hardware and weatherize all connections fine to mast if possible will perform better coax shield is fine BTW

73's
Lucas KB9MEJ

Lucas
February 4, 2016 at 11:45 pm

Clarification to 1st reply will INCREASE gain way originally worded as would decrease gain NOT TRUE sorry for fat finger mixup friends
Radio and electronics And teaching is what I do and I'm broke I make EVERYTHING!!! especially when I can use scrap or leftovers

73's
Lucas KB9MEJ

Ben
March 7, 2017 at 3:21 pm

I want to build a DIY HDTV Antenna but I need a good booster and likely some sort good HDTV Signal Filter because I live about 80 miles from any major city. This will be my first try at building the HDTV antenna the mechanics of building the Antenna are simple to me. But the electronic I will have to depend on the experts. I did find the HDHomeRun Type: HDHR3-4DC DVB-C (unencrypted digital cable TV)// and the SiliconDust-HDHomeRun PRIME TV Tuner – 3 Tuners Model#: HDHR3-CC however I need more understanding about how these will help me with the DIY HDTBV ANTENNA.

Bob Hays
April 28, 2017 at 10:36 pm

I've built 2 of these. They work better then the square ones I've bought.

loading